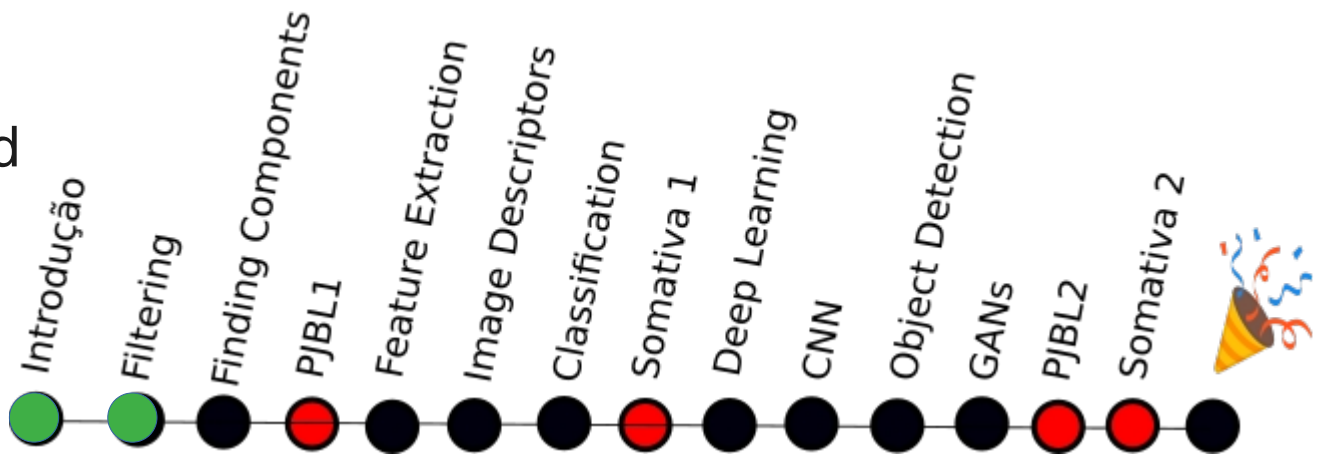
Lecture 03 - Morphology

Prof. André Gustavo Hochuli

gustavo.hochuli@pucpr.br
aghochuli@ppgia.pucpr.br

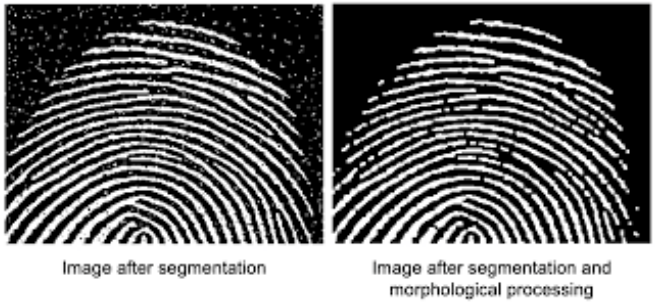
Topics

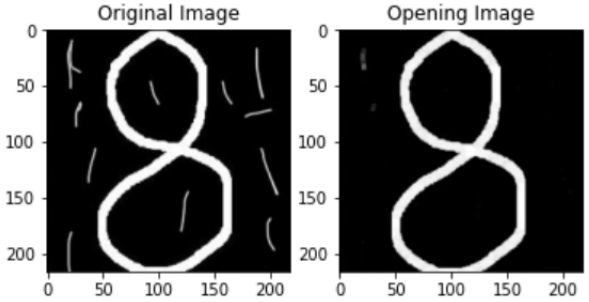
- Discussion of Practice 02
- Mathematical Morphology
  - Structuring Element (or Kernel)
  - Erode /Dilate
  - Open / Close
  - Gradients
  - Watershed
- Practice

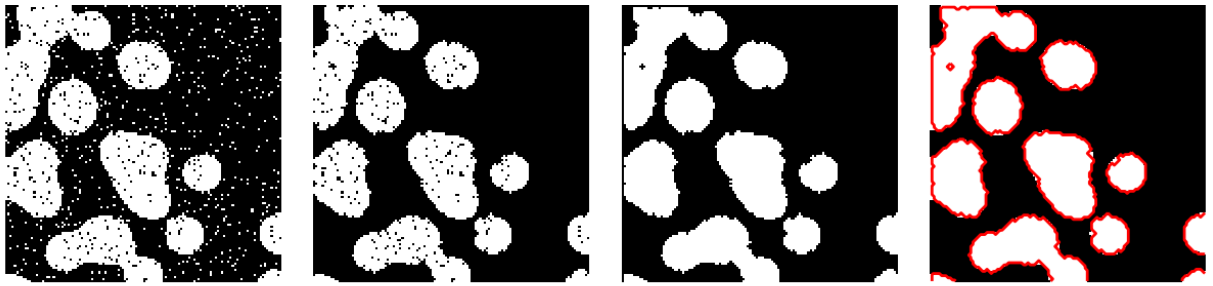


Mathematical Morphology

- Morphology (Nature): Branch of Biology that study the form and structure of animals and plants
- Morphology (Image Processing): Mathematical operations to extract image components based on pixel neighborhood.
- Increase/Decrease Objects Size, Reduce Noise, Closing or Open (GAPS)

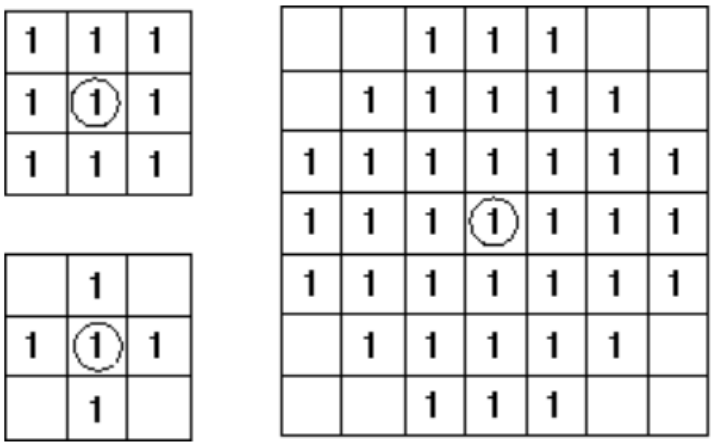






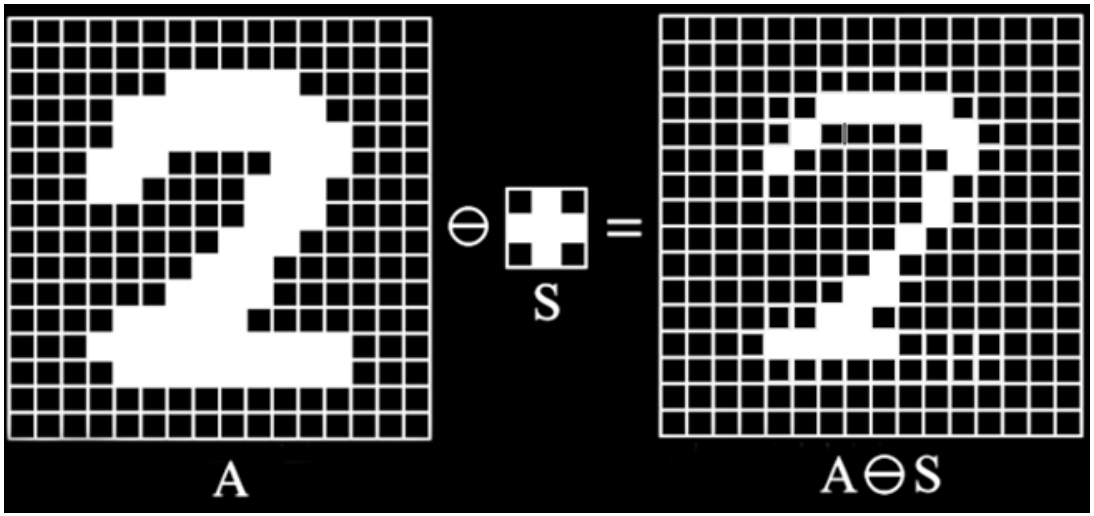
Structuring Element (Kernel)

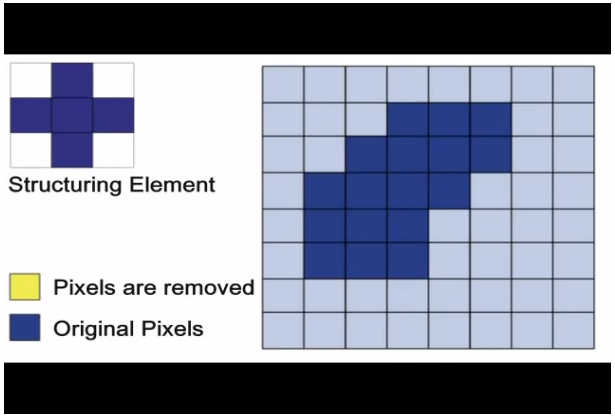
- Defines the shape of the structure to be applied
- The structure is slid through the image
- Erosion or Dilate operations are applied
- The origin determines the pixel be changed



Erosion

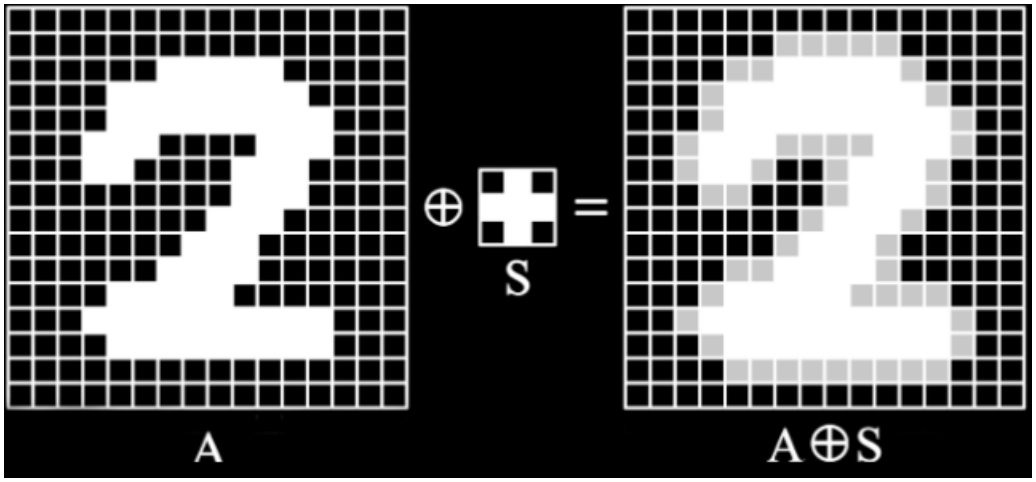
- Moves one’s to zero’s
- Binary ‘AND’ Operation
- Reduces Noises and Contours

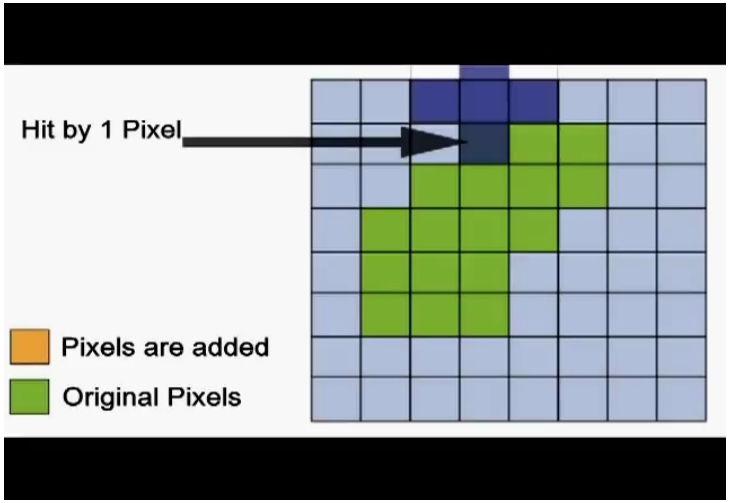




Dilation

- Moves zero’s to one’s
- Binary ‘OR’ Operation
- Increases Objects, connects contours, and fill holes.





Opening and Closing

- Combined morphological operations that preserve the shape and size o large objects in the image

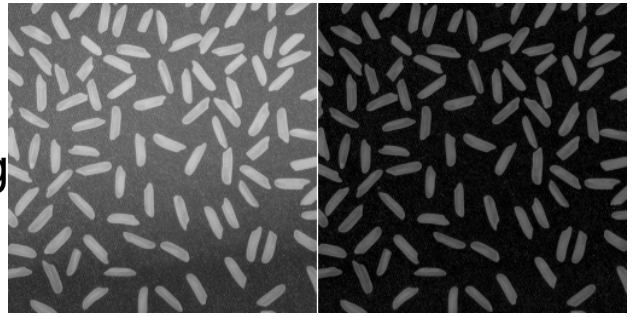
  - Opening: Erode + Dilate
    - Removes small objects, noises, and thin lines

  - Closing: Dilate + Erode
    - Fill small holes and connect segmented cont

Others Morphological Operations

- Gradient: Dilate - Erosion
  - Outline de Object

- TopHat: Open – Original Image
  - Reduce the effect of brightness chang
  - Isolates brightness objects



Let’s code!

- Link: Morphology Operators